



PERFORMANCE OF AGGREGATION PHEROMONE AGAINST RED PALM WEEVIL AT DISTRICT KHAIRPUR AND SUKKUR, PAKISTAN

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ABSTRACT

Red palm weevil (RPW) is one of the notorious pest of palms through out the world including Pakistan. In most parts of the world, aggregation pheromone lures comprising of ferruginol (4-methyl-5-nonanol), used to attract adults RPW. However, its use in Pakistan is still limited especially in Sindh province (Khairpur and Sukkur districts) and mostly trunk injection of pesticides is a common practice to control RPW. Therefore, this preliminary study was conducted in three talukas (Thari Mirwah, Kot Digi and Rohri) of Khairpur and Sukkur districts to evaluate the efficacy of RPW aggregation pheromone in the attraction, mass trapping and killing of RPW adults. In all locations, RPW pheromone lures were found effective in attracting the adult RPW, with the highest number of RPW catches recorded in Rohri, district Sukkur followed by Kot Digi and Thari Mirwah talukas of Khairpur district. Therefore, it is suggested that long term studies should be conducted in all the date growing areas of Sindh and other date growing areas of Pakistan to manage the population of RPW using pheromone lures and thus, reduce the reliance on synthetic pesticides.

Keywords: Red palm weevil, pheromones, lure, ferruginol, Khairpur, Sukkur

INTRODUCTION

The date palm (*Phoenix dactylifera* L.) is one of the early cultivated crops in the world (Zohary and Hopf, 2000). It is mostly cultivated in the tropical regions of the world and constituted an integral part of small and large scale farming system in such areas of the world (Khushk *et al.*, 2009). Its fruit is rich source of nutrients and is considered as one of the greatest per acre producer of food (Zaid and Wet, 2002). The date palm fruits contain a high percentage of carbohydrates (up to 48%), fat (up to 0.5%), proteins (up to 5.6%), pectin 3.9%, dietary fibre (11.5%), at least 15 salts, minerals and six vitamins. Thus, dates (date palm fruits) are not only a complete food supplement in human diet, but also possess several environmental benefits; hence, making it a potential food for the future (Al-Shahib and Marshall, 2003).

Pakistan is the 5th largest producer of dates in the world. During 2014-15, 537,204 tonnes of dates were produced in Pakistan from date's cultivated area of 91,145 hectares (GOP, 2017). Pakistan is also one of the largest exporter of fresh and dry dates that are mostly exported to India, USA, UK, Canada, Germany, Denmark, Malaysia and Indonesia (Abul-Saod, 2011). Khairpur and Sukkur (Sindh), Turbat and Panjgoor

(Baluchistan), Muzaffar Garh, Jhang, Multan and D.G Khan (Punjab) and D.I. Khan (KPK) are the major dates growing areas in Pakistan (GOP, 2017). The main date palm varieties of the country are Begum Jangi of Balochistan, Aseel of Sindh and Dhakki of Dera Ismail Khan, Khyber Pukhtunkhwa.

Although, Pakistan is one of the largest producer of dates but per acre yield is still far below than the competing countries of the world. There are many constraints to low productivity of dates in Pakistan and palm losses due to the red palm weevils are also one of them. Red palm weevil (RPW) *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae) is one of the invasive pest of palms throughout the world (Abbas, 2010). It attacks on more than 26 palm tree belonging to 16 different genera in almost all palm growing areas of Asia, North Africa, Europe, Oceania and Caribbean countries (EPPO, 2007; Malumphy and Moran 2009). It is very difficult to detect the presence of the pest in the early stage of its attack because it mostly remained concealed inside the tree, whereas, in case of severe attack, damaged palms can harbor many overlapping stages at the same time (Faleiro 2006). Most widely used technique for the management is the trunk injection of systematic insecticides, but the same pose great threat to humans and their environment. Therefore, in recent years,

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emphasis has been shifted to use integrated management strategies especially using pheromone based traps for the monitoring and mass trapping of RPW (Faleiro, 2006; Al-Saud *et al.*, 2010). The ferruginol; 4-methyl-5-nonanol is an aggregation pheromone released by the RPW males to attract adults, particularly females (Abraham *et al.*, 2001). However, in Khairpur district, growers are still unaware about the use of pheromones and use traditional pesticide based management tools for controlling RPW. Therefore, this study was conducted to evaluate the efficiency of pheromonal traps to monitor the population of RPW in different locations of Khairpur and Sukkur districts.

MATERIALS AND METHODS

Study locations

This study was conducted at two talukas of district Khairpur i.e. Thari Mirwah and Kot Diji and one taluka of district Sukkur i.e. Rohri. Three locations each were selected from the individual talukas and were treated as replications and are given below:

Location	Taluka/Tehsils	District
Village M. Anwar Memon	Thari Mirwah	Khairpur
Village Hafiz Abdul Haleem		
Village Shamsdin Memon		
Village Muhram Halipoto	Kot Diji	Khairpur
Village Faqir Muhab		
Village Habibullah Lakho		
Village Ali Ahmed Katohar	Rohri	Sukkur
Village Mureed Dharejo		
Village Jaweed Khan Maitlo		

Preparation and installation of pheromonal traps

The traps were set in plastic bucket of size 36 cm L and 26, 20 cm diameter at top and bottom, respectively. Each trap and its lid had four equidistant rectangular (3 x 7 cm) openings to allow the entrance of *R. ferrugineus*. Red palm weevil aggregation pheromone [(ferruginol; 4-methyl-5-nonanol) AMCO Limited, Malaysia] were attached to the top of the bucket with the help of a wire. Talstar (Bifenthrin) @ 5 ml mixed in 5 L of water was placed in the trap for the killing of attracted weevils. The traps were placed near to the base of a date palm tree to protect the traps from extreme heat for their continuous and long-term efficacy against the weevils.

Data collection and analysis

The data was collected on daily basis till the period when no weevil was captured for the continuous three days and same was treated that pheromones have lost their efficiency to attract weevils. The number of weevils killed in the traps were collected and counted. The collected data was analyzed through Analysis of Variance using SAS 9.3 statistical software, whereas the means with significant difference were separated using the Least Significant Difference at 0.5 probability level.

RESULTS AND DISCUSSION

The study results confirmed the potential of RPW pheromone to attract weevils at all the three locations i.e., Thari Mirwah, Kot Diji and Rohri. The RPW adults were attracted to traps immediately after the installations, however, the efficacy of catches increased with the time and the same may be due to dissemination of odor of pheromones to vast areas and searching ability of weevils to locate the traps. Moreover, a highly significant difference was recorded in the number of RW catches at different locations ($F= 47.10$, $p < 0.001$) and the same may be due to difference in the micro-climatic

conditions of the study areas, age of the palm trees and the management practices adopted by the growers. Accordingly, overall the highest RPW captures were recorded at Rohri (2.61 ± 0.21 weevil per day), followed by Kot Diji (1.67 ± 0.33 weevils per day) and Thari Mirwah (1.29 ± 0.27 weevil per day) (Table 1). Many previous studies confirmed the potential of RPW pheromones in the trapping and mass killing of the weevils (Sivapragasam *et al.*, 2010; El-Shafie *et al.*, 2011; Abuagla and Al-Deeb, 2012; Azmi *et al.*, 2014). It is also recommended to use pesticides i.e., deltamethrin, carbaryl or chlorpyrifos that showed minimal deterrence to weevils towards the pheromone traps (Faleiro, 2006). Moreover, it has also been suggested to use additional baits such as palms, sugarcane, banana, pineapple etc. or ethyl acetate to enhance the efficacy of pheromonal traps to capture more RPWs (Porcelli *et al.*, 2009; Hoddle and Hoddle, 2011; Azmi *et al.*, 2014).

CONCLUSION

The preliminary study at Khairpur and Sukkur districts confirmed that RPW pheromone lures should be used in the integrated pest management of the weevils in the area as they produce the major production of dates in Pakistan. Moreover, further studies should be conducted to evaluate the effect of different food baits, trap colors and environment factors on the efficiency of RPW catches.

AUTHORS' CONTRIBUTION

Arfan Ahmed Gilal and Muhammad Ishaque Mastoi conceived the idea and wrote a paper, Mushtaque Hussain Soomro conducted the experiment (installation of traps, data collection handling and compilation etc) and Muzaffar Ali Talpur analysed the data and other input for improvement in article.

Table 1

Efficacy of RPW pheromone to capture RPW at three different locations of District Khairpur and Sukkur, Sindh

Observation Dates	Thari Mirwah	Kot Digi	Rohri
April 23, 2017	2.00±0.00	2.67±1.67	1.00±0.00
April 24, 2017	1.00±0.00	1.33±0.33	2.00±0.00
April 25, 2017	1.00±0.58	2.67±0.33	4.00±0.58
April 26, 2017	1.67±0.33	3.33±0.33	3.00±0.00
April 27, 2017	0.67±0.33	3.67±2.18	4.33±0.88
April 28, 2017	1.00±0.58	0.33±0.33	2.33±0.33
April 29, 2017	0.33±0.33	1.33±0.33	3.67±0.67
April 30, 2017	2.67±1.33	1.33±0.88	2.33±0.33
May 01, 2017	0.00±0.00	3.33±0.33	2.00±0.00
May 02, 2017	0.00±0.00	1.33±0.67	3.67±1.20
May 03, 2017	0.00±0.00	1.00±0.58	2.67±1.20
May 04, 2017	0.00±0.00	1.67±0.88	2.67±0.67
May 05, 2017	0.00±0.00	1.33±0.67	2.33±0.33
May 06, 2017	0.00±0.00	0.67±0.33	2.67±0.67
May 07, 2017	0.00±0.00	1.00±0.58	1.33±0.67
May 08, 2017	0.00±0.00	1.33±0.67	3.00±0.58
May 09, 2017	0.00±0.00	0.67±0.33	2.67±0.33
May 10, 2017	0.00±0.00	1.00±0.58	1.33±0.33
Overall mean	1.29±0.27b	1.67±0.33b	2.61±0.21a

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